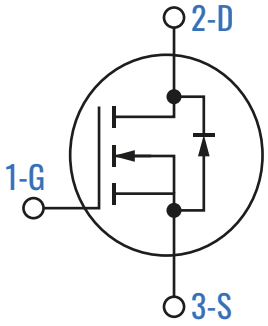
SD11710

700V SiC N-Channel Power MOSFET - 1

KEY FEATURES

- I_D = 50A
- $R_{DS(ON)}$ = 15mΩ
- ISOLATED BACKSIDE
- TO-258 HERMETICALLY SEALED PACKAGE
- MIL-PRF-19500 SCREENING AVAILABLE
- LOW CAPACITANCES AND LOW GATE CHARGE
- FAST SWITCHING SPEED DUE TO LOW INTERNAL GATE RESISTANCE (ESR)
- STABLE OPERATION AT HIGH JUNCTION TEMPERATURE, $T_{J(MAX)}$ = 175 °C
- FAST AND RELIABLE BODY DIODE
- SUPERIOR AVALANCHE RUGGEDNESS
- ROHS COMPLIANT



V_{DS} = 700V
I_D @ 25°C = 140A
$R_{DS(on)}$ = 15mΩ

ORDERING GUIDE

Part Number SD11710

Description 700V SiC N-Channel Power MOSFET

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C)

SYMBOL	CHARACTERISTIC		VALUE	UNIT
V_{DS}	Drain-Source Voltage		700	V
V_{GS}	Gate-Source Voltage (dynamic)		23 to -10	V
I_D	Continuous Drain Current	T_C = 25°C	140	A
		T_C = 100°C	99	
$I_{D,\ pulse}$	Pulsed Drain Current *		350	A
P_D	Maximum Power Dissipation		455	W
	Linear Derating Factor		3.03	W / °C

* Repetitive rating: pulse width and case temperature limited by maximum junction temperature.

THERMAL AND MECHANICAL CHARACTERISTICS

SYMBOL	CHARACTERISTIC	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction-to-Case Thermal Resistance		0.22	0.33	°C / W
T_J	Operating Junction Temperature	-55		+175	°C
T_{STG}	Storage Temperature	-55		+150	°C
T_L	Soldering Temperature for 10s (1.6mm from case)			+300	°C
	Mounting Torque, 6-32 or M3 Screw			10 11	lbf-in N-m
W_t	Package Weight		0.22 6.2		oz g

ELECTRICAL CHARACTERISTICS, STATIC (T_J = 25°C)

SYMBOL	CHARACTERISTIC	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 100µA	700			V
$R_{DS\ (on)}$	Drain-source on resistance *	V_{GS} = 20V, I_D = 40A		15	19	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_{DS} = 4mA	1.9	2.4		V
$\Delta V_{GS(th)}/\Delta T_J$	Threshold Voltage Coefficient	V_{GS} = V_{DS}, I_{DS} = 4mA		-3.4		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 700V, V_{GS} = 0V, T_J = 25°C			100	µA
		V_{DS} = 700V, V_{GS} = 0V, T_J = 125°C			500	
I_{GSS}	Gate-Source Leakage Current	V_{GS} = 20V/-10V			±100	nA

* Pulse test: pulse width < 380 µs, duty cycle < 2%.

ELECTRICAL CHARACTERISTICS, DYNAMIC (T_J = 25°C)

SYMBOL	CHARACTERISTIC	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
C_{iss}	Input Capacitance	V_{GS} = 0V, V_{DD} = 700V, V_{AC} = 25mV, f = 1MHz		4500		pF
C_{rss}	Reverse Transfer Capacitance			29		
C_{oss}	Output Capacitance			510		
Q_g	Total Gate Charge	V_{GS} = -5V/20V, V_{DD} = 470V, I_D = 40A		215		nC
Q_{gs}	Gate-Source Charge			58		
Q_{gd}	Gate-Drain Charge			35		
$t_{d(on)}$	Turn-On Delay Time	V_{GS} = -5V/20V, V_{DD} = 470V, I_D = 40A, $R_{g(ext)}$ = 2.5Ω Freewheeling diode = MSC015SMA070B (V_{GS} = -5V)		20		ns
t_f	Voltage Fall Time			35		
$t_{d(off)}$	Turn-Off Delay Time			35		
t_r	Voltage Rise Time			18		
E_{on}	Turn-On Switching Energy			420		µJ
E_{off}	Turn-Off Switching Energy			90		
$t_{d(on)}$	Turn-On Delay Time	V_{GS} = -5V/20V, V_{DD} = 470V, I_D = 40A, $R_{g(ext)}$ = 2.5Ω Freewheeling diode = MSC015SMA070B		20		ns
t_f	Voltage Fall Time			32		
$t_{d(off)}$	Turn-Off Delay Time			38		
t_r	Voltage Rise Time			10		
E_{on}	Turn-On Switching Energy			217		µJ
E_{off}	Turn-Off Switching Energy			118		
ESR	Equivalent Series Resistance	f = 1MHz, 25mV, drain short		0.69		Ω
SCWT	Short Circuit Withstand Time	V_{DS} = 560V, V_{GS} = 20V		3		µs
E_{AS}	Avalanche Energy, Single Pulse	V_{DS} = 150V, I_D = 40A		4400		mJ

BODY DIODE CHARACTERISTICS (T_J = 25°C)

SYMBOL	CHARACTERISTIC	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{SD}	Diode Forward Voltage	V_{GS} = 0V, I_{SD} = 40A		3.4		V
		V_{GS} = -5V, I_{SD} = 10A		3.8		
t_{rr}	Reverse Recovery Time	V_{GS} = -5V, I_{SD} = 40A, V_{DD} = 470V, dI/dt = -1200A/µS		40		nS
Q_{rr}	Reverse Recovery Charge			495		nC
I_{RRM}	Peak Reverse Recovery Current			19		A

TYPICAL PERFORMANCE CURVES

Fig 1: Drain Current vs. V_{DS} , V_{GS} = 20V

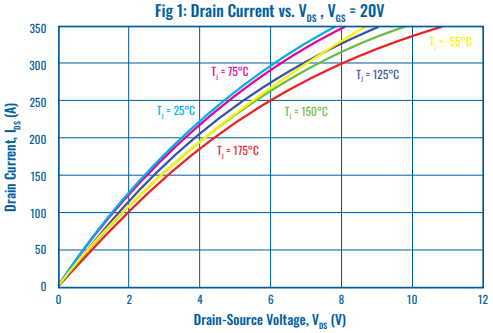


Fig 2: Drain Current vs. V_{DS} , T_J = 25°C

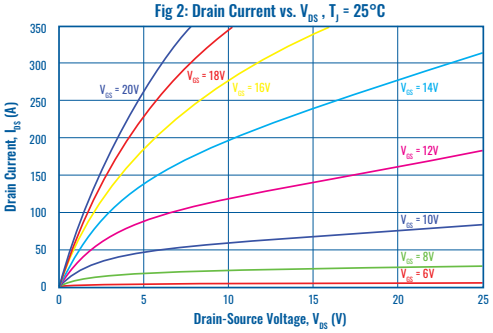


Fig 3: Drain Current vs. V_{DS} , T_J = 150°C

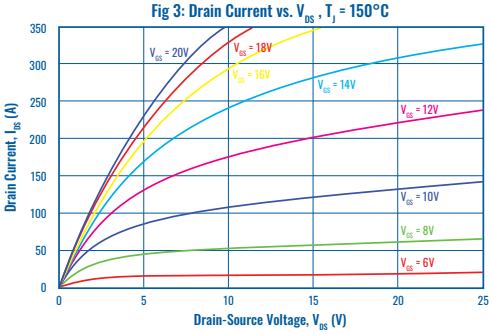


Fig 4: Drain Current vs. V_{DS} , T_J = 175°C

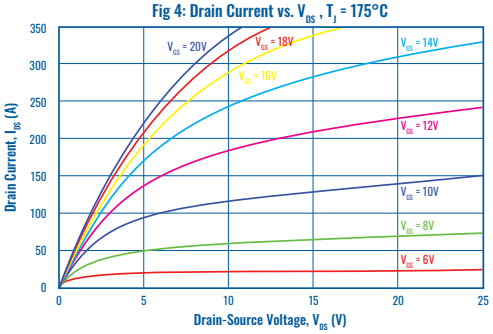


Fig 5: Normalized On-Resistance vs. Junction Temperature

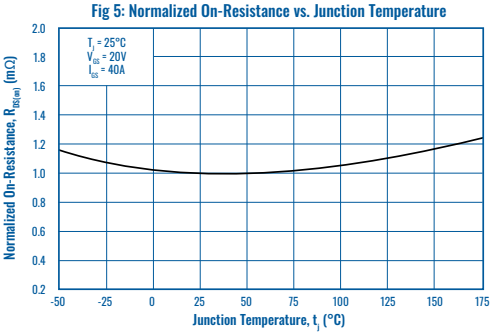
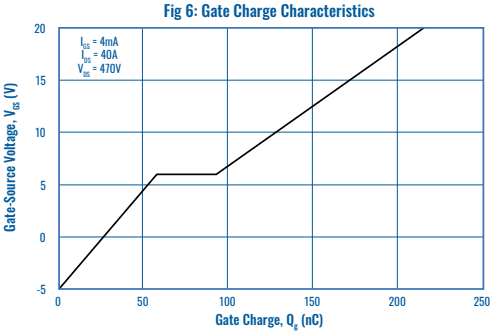


Fig 6: Gate Charge Characteristics



TYPICAL PERFORMANCE CURVES, CONT.

Fig 7: Capacitance vs. Drain-Source Voltage

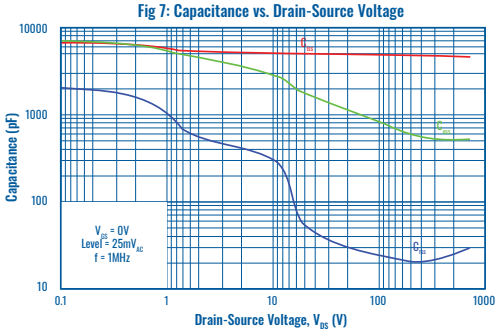


Fig 8: Pulsed Drain Current vs. Gate Source Voltage

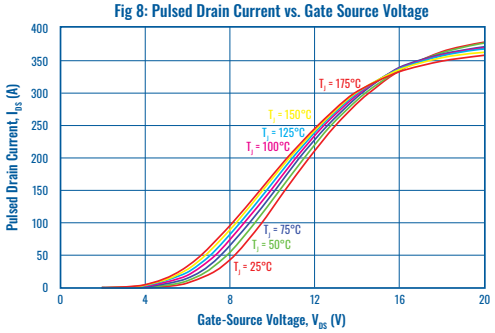


Fig 9: 3rd Quadrant Characteristics T_J = 25°C

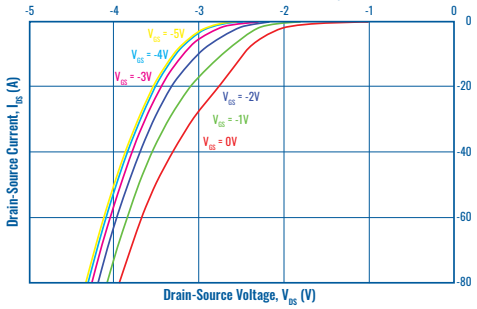


Fig 10: 3rd Quadrant Characteristics T_J = 150°C

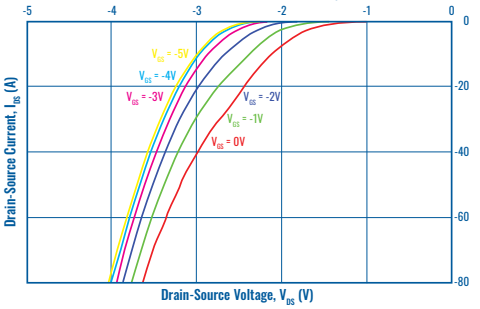


Fig 11: Switching Energy On vs. Drain Source Voltage

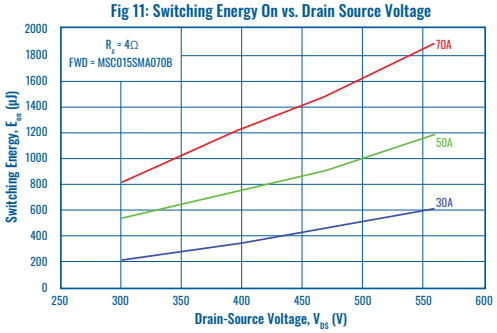


Fig 12: Switching Energy Off vs. Drain Source Voltage

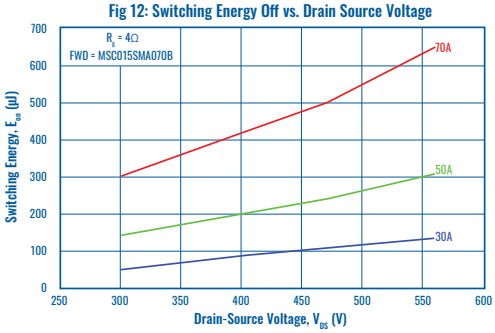


Fig 13: Switching Energy vs. Gate Resistance

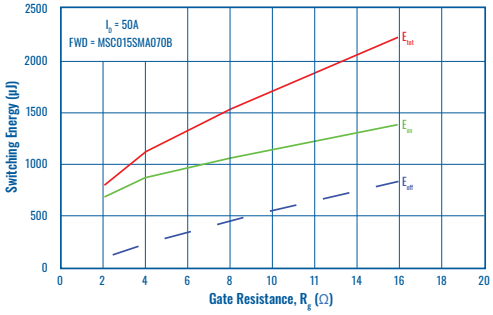
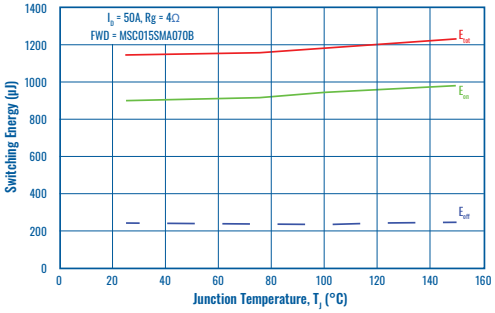


Fig 14: Switching Energy vs. Junction Temperature



TYPICAL PERFORMANCE CURVES, CONT.

Fig 15: Switching Energy On vs. Drain Source Voltage

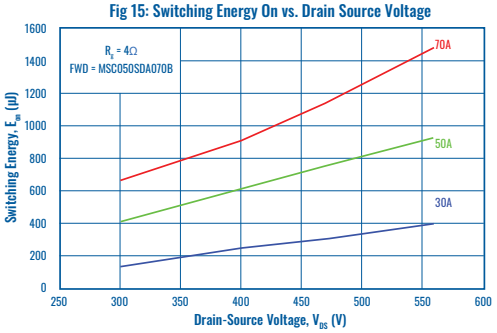


Fig 16: Switching Energy Off vs. Drain Source Voltage

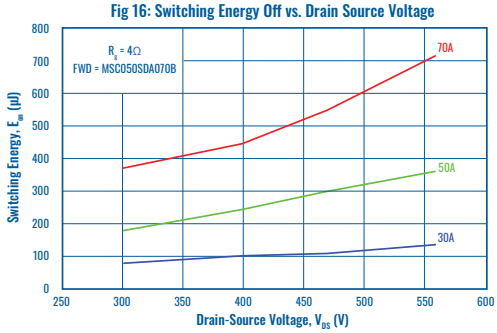


Fig 17: Switching Energy vs. Gate Resistance

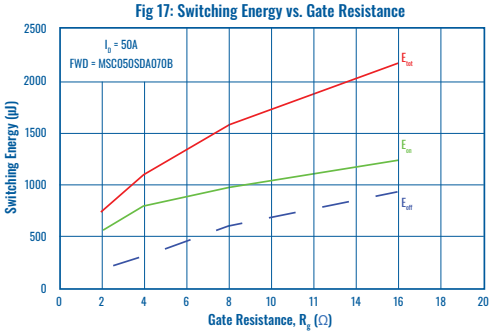


Fig 18: Threshold Voltage vs. Junction Temperature

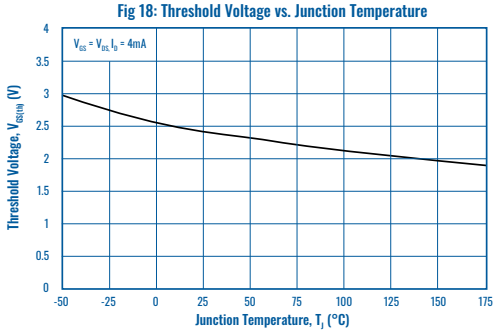


Fig 19: Safe Operating Area

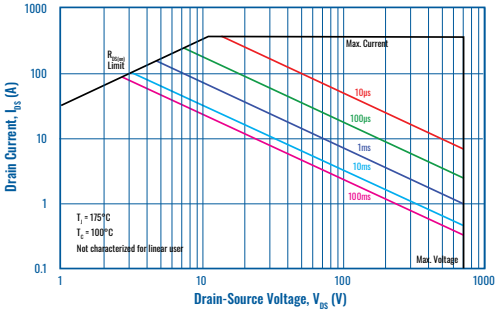
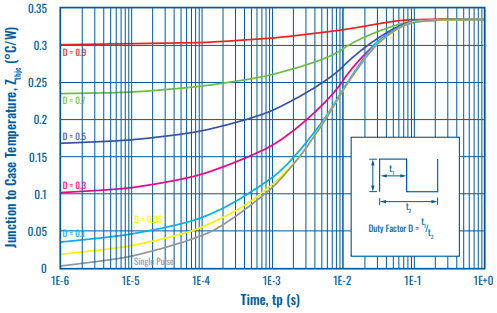


Fig 20: Thermal Impedance



OUTLINE DIMENSIONS, IN INCHES (MM)